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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/305,019 05/04/99 ROTH

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023455 IM52/0201  
EXXONMOBIL CHEMICAL COMPANY  
P O BOX 2149  
BAYTOWN TX 77522-2149

EXAMINER

NGUYEN, T

ART UNIT

PAPER NUMBER

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UNITED STATES DEPARTMENT OF COMMERCE  
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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 13

Application Number: 09/305,019  
Filing Date: May 04, 1999  
Appellant(s): ROTH ET AL.

**MAILED**

**JAN 31 2001**

**GROUP 1700**

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Laurence P. Hobbes  
For Appellant

**EXAMINER'S ANSWER**

This is in response to appellant's brief on appeal filed October 24, 2000.

**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

**(3) Status of Claims**

The statement of the status of the claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Invention**

The summary of invention contained in the brief is correct.

**(6) Issues**

The appellant's statement of the issues in the brief is correct.

**(7) Grouping of Claims**

Appellant's brief includes a statement that claims 4-9 and claim 10 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

**(8) Claims Appealed**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) Prior Art of Record**

0773608	European	9-1996
5,557,024	Cheng et al.	9-1996
4,891,458	Innes et al.	1-1990

**(10) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 4-9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0733608 ('608) in view of Cheng et al. (5,557,024).

The '608 reference discloses a transalkylation process of polyalkylbenzenes (e.g., polyethylbenzene) which are produced during the alkylation of benzene with olefins (e.g., ethylene) by using a crystalline aluminosilicate catalyst having an average size of less than about  $0.50\ \mu\text{m}$ . The alkylation and the transalkylation processes are conducted at a temperature between  $250^{\circ}\text{C}$  and  $500^{\circ}\text{C}$ , a pressure between 200 psi and 500 psi (1390 - 3447 kPa), at a WHSV from about 20 to  $150\ \text{hr}^{-1}$ , and a feeding ratio of benzene to ethylene from about 2:1 to 20:1. The reference discloses that the transalkylation process can be operated in a separate reactor, but it is preferred to recycle the polyalkylbenzenes to the transalkylation reactor. (See page 2 through page 3)

The '608 reference does not specifically disclose that the alkylation/transalkylation step is operated in the liquid phase, does not disclose that the alkylation catalyst is MCM-56 and the transalkylation catalyst is TEA-mordenite, and does not disclose operating the transalkylation in a separate reactor.

Cheng discloses alkylation and transalkylation processes in which a feed containing an aromatic compound (e.g., benzene) and olefins (e.g., ethylene) is contacted with MCM-56 or beta zeolite catalyst in an alkylation zone to produce monoalkylbenzene products such as ethylbenzene. By-products (e.g., polyalkylbenzene), which are produced in the alkylation step, can be recycled to the alkylation reactor to undergo transalkylation or they can be reacted with

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additional aromatic feed in a separate reactor in the presence of TEA mordenite catalyst to produce monoalkylbenzene products. The reference discloses that the transalkylation zone is operated in a stoichiometric excess of aromatic compounds. Therefore, the ratio of benzene to polyalkylbenzene is greater than one. (See col. 3, lines 25-27; col. 6, line 2; col. 12, line 10 through col. 14, line 40)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the '608 process by utilizing MCM-56 as an alkylation catalyst and TEA mordenite as an transalkylation catalyst as suggested by Cheng because the '608 reference discloses that any crystalline aluminosilicate catalyst can be used in the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have to modified the '608 process by operating the process in the liquid phase because Cheng discloses that the alkylation and transalkylation processes can be conducted in either vapor phase or liquid phase. Therefore, it would be expected that the results would be the same or similar when operating the '608 process at the liquid conditions or vapor conditions.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the '608 process by operating the transalkylation process in a separate reactor because Cheng discloses that the polyalkylated products can be recycled to the alkylation reactor to undergo transalkylation or they can be reacted with additional aromatic feed in a separate reactor. Therefore, it would be expected that the results would be similar or the same when operating the transalkylation step of the '608 process in a separate reactor.

Claim 10 stands rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 4 above, and further in view of Innes et al. (4,891,458).

All of the references above do not disclose the claimed transalkylation operating pressure and the weight ratio of benzene to polyalkylated benzene.

Innes discloses a transalkylation process of polyalkylbenzene and an aromatic compound (e.g., benzene) in which the transalkylation process is operated at a pressure of 50 psig to 100 psig (344 -6894 kPa) to maintain the process in the liquid phase. The reference also discloses that the molar ratio of aromatic hydrocarbon to polyalkylated aromatic hydrocarbon ranges from about 1:1 to about 50:1. This ratio appears to be within the range of the claimed weight ratio. (See col. 5, lines 43-54)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the '608/Cheng process by operating the transalkylation process at the pressure and the molar ratio of aromatic hydrocarbon to polyalkylated aromatic hydrocarbon as taught by Innes because the Innes pressure will maintain the process in the liquid phase and the Innes ratio is effective for a transalkylation process of an aromatic hydrocarbon with an polyalkylated aromatic hydrocarbon.

**(11) Response to Argument**

The argument that the '608 reference does not disclose the size of the catalyst in a separate transalkylation reactor is noted. However, the argument is not persuasive because the reference discloses that the alkylation/transalkylation reaction zone employs a catalyst which has the same size as the claimed catalyst. Therefore, it would be expected that the same catalyst size

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would be used when a separate transalkylation reactor is employed in the process of the '608 reference.

The argument that the '608 reference is conducted in the vapor phase is noted. However, the argument is not persuasive because the examiner maintains that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the '608 process by operating the process in the liquid phase because Cheng discloses that the alkylation and transalkylation processes can be conducted in either vapor phase or liquid phase. Therefore, it would be expected that the results would be the same or similar when operating the '608 process at the liquid conditions or vapor conditions.

The argument that the polyalkylated species of the '608 reference is recycled to the alkylation reactor whereas the polyalkylated species of the present invention is passed into a transalkylation zone which is separate from the alkylation reactor is noted. However, the argument is not persuasive because, in lines 20 and 21 of page 2, the reference discloses that the polyethylbenzenes can be directed to a separate transalkylation reactor or recycled to the alkylation reactor.

The argument that the '608 reference does not teach using a crystallized TEA-mordenite catalyst in a separate transalkylation reactor is noted. However, the argument is not persuasive because the reference discloses that **any aluminosilicate catalyst having a crystal size less than 0.50  $\mu\text{m}$**  can be used in the process. The secondary reference, Cheng et al., discloses that an aluminosilicate catalyst such as TEA-mordenite can be used in a transalkylation process. Therefore, the examiner maintains that it would have been obvious to one having ordinary skill

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in the art at the time the invention was made to have modified the '608 process by utilizing a TEA mordenite as a transalkylation catalyst as suggested by Cheng.

The argument that there is no motivation to combine the '608 reference and the Cheng reference since the size of the Cheng catalyst is much smaller than the size of the '608 catalyst is noted. However, the argument is not persuasive because the examiner modifies the '608 process by using TEA-mordenite as a type of aluminosilicate catalyst **having a crystal size less than 0.50  $\mu\text{m}$** . The examiner does not change the **size** of the '608 catalyst. Moreover, the '608 reference discloses that a **maximum pore size** of the catalyst ranges from about 100 to 1800Å. Therefore, a catalyst having pore size smaller than 100 to 1800Å can be used the '608 process. Finally, there is no evidence to show that the Cheng catalyst has a smaller pore size than the '608 catalyst.

The argument that the '608/Cheng process would use a beta-zeolite catalyst in the transalkylation zone is noted. However, the argument is not persuasive because Cheng discloses that the TEA-mordenite catalyst can be used in a transalkylation under either vapor condition or liquid condition, so a beta-zeolite catalyst does not need to be used the '608/Cheng process.

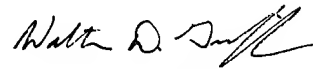
Since neither the '608 reference nor the Cheng reference discloses the operation conditions of the process in a liquid phase, the Innes reference discloses operating conditions for a transalkylation process in a liquid phase. Therefore, the examiner maintains that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the '608/Cheng process by operating the transalkylation process at the pressure as taught by Innes because the Innes pressure will maintain the process in the liquid phase.



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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



**Walter D. Griffin**  
**Primary Examiner**

Tam Nguyen/TN  
January 22, 2001

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